DOCUMENT RESUME

ED 059 299 TM 001 191

TITLE	Fettler 8-66.01 -- Technical Report on Standardization of the General Aptitude Test Battery.
INSTITUTION	Manpower Administration (DOL), Washington, D.C. U.S. Training and Employment Service.
REPORT NO	TR-S-22
PUB DATE	Aug 55
NOTE	8p.
EDRS PRICE	MF-$0.65 HC-$3.29
DESCRIPTORS	*Aptitude Tests; *Ceramics; Evaluation Criteria; Job Applicants; *Job Skills; Norms; Occupational Guidance; *Personnel Evaluation; Test Reliability; Test Validity
IDENTIFIERS	Fettler; GATB; *General Aptitude Test Battery

ABSTRACT

The United States Training and Employment Service General Aptitude Test Battery (GATB), first published in 1947, has been included in a continuing program of research to validate the tests against success in many different occupations. The GATB consists of 12 tests which measure nine aptitudes: General Learning Ability; Verbal Aptitude; Numerical Aptitude; Spatial Aptitude; Form Perception; Clerical Perception; Motor Coordination; Finger Dexterity; and Manual Dexterity. The aptitude scores are standard scores with 100 as the average for the general working population, and a standard deviation of 20. Occupational norms are established in terms of minimum qualifying scores for each of the significant aptitude measures which, when combined, predict job performance. Cutting scores are set only for those aptitudes which aid in predicting the performance of the job duties of the experimental sample. The GATB norms described are appropriate only for jobs with content similar to that shown in the job description presented in this report. A description of the validation sample is included. (AG)

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ED 059299

TECHNICAL REPORT

ON

STANDARDIZATION OF THE GENERAL APTITUDE TEST BATTERY

FOR

FETTLER 8-66.01

B-232
or
S-22

U.S. DEPARTMENT OF HEALTH,
EDUCATION & WELFARE
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U. S. Employment Service in
Cooperation with
Ohio State Employment Service

U. S. DEPARTMENT OF LABOR
Bureau of Employment Security
Washington 25, D. C.
Revised August 1955

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GATB #630
June 1951

STANDARDIZATION OF THE GENERAL APTITUDE TEST BATTERY FOR FETTLER 8-66.01

B-232 or S-22

Summary

The General Aptitude Test Battery, B-1001 was administered in June 1951 to 39 women employed as Fettler 8-66.01 at the Mosaic Tile Company, Zanesville, Ohio. Four of the 39 women were eliminated from the sample, leaving a final experimental sample of 35. The criteria consisted of supervisory ratings prepared by the General Foreman, Day Foreman and the Night Foreman. On the basis of mean scores, standard deviations, correlations with the criteria, job analysis data, and their combined selective efficiency, Aptitudes F-Finger Dexterity and M-Manual Dexterity were selected for inclusion in the test norms.

GATB Norms for Fettler 8-66.01 - B-232 or S-22

Table I shows, for B-1001 and B-1002, the minimum acceptable score for each aptitude included in the test norms for Fettler 8-66.01.

TABLE I

Minimum Acceptable Scores on B-1001 and B-1002 for B-232 or S-22

B-1001			B-1002		
Aptitude	Tests	Minimum Acceptable Aptitude Score	Aptitude	Tests	Minimum Acceptable Aptitude Score
F	CB-1-O CB-1-P	80	F	Part 11 Part 12	75
M	CB-1-M CB-1-N	75	M	Part 9 Part 10	75

Effectiveness of Norms

The data in Table IV indicate that 6 of the 11 poor workers, or 55 percent of them, did not achieve the minimum scores established as cutting scores on the recommended test norms. This shows that 55 percent of the poor workers would not have been hired if the recommended test norms had been used in the selection process. Moreover, 21 of the 26 workers who made qualifying test scores, or 81 percent, were good workers.

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TECHNICAL REPORT

I. Problem

This study was conducted to determine the best combination of aptitudes and minimum scores to be used as norms on the General Aptitude Test Battery for the occupation of Fettler 8-66.01.

II. Sample

Thirty-nine women employed as Fettler 8-66.01 by the Mosaic Tile Company, Zanesville, Ohio, were tested in June 1951 with the General Aptitude Test Battery, B-1001. After testing, four of the women were eliminated from the sample; one had only a fourth-grade education and was unable to comprehend the practice exercises completely; two appeared to be inadequately motivated during the administration of at least two parts of the test battery; and one had less than four weeks of training, which is the minimum training period for the job. Thus the final sample consisted of 35 women.

Two Fettlers, one with a fifth-grade education and the other with a fourth-grade education were included in the sample. These two workers did not appear to be handicapped by their relatively low educational level. Comprehension of practice exercises seemed adequate and general performance on the tests, as determined by inspection of test scores, was consistent with that of the group as a whole.

In the past, psychometric devices have not been used for selecting Fettlers in this plant. Also, pre-employment physical or mental standards have not been used in hiring Fettlers.

Table II shows the means, standard deviations, ranges, Pearson product-moment correlations with the criteria for age, education and experience.

TABLE II

Means (M), Standard Deviations (σ), Ranges, Pearson Product-Moment Correlations with the Criteria (rF_1 - Rank order ratings of General Foreman converted to linear values), (rF_2 - Rank order ratings of Day Foreman converted to linear values) and (rF_3 - Rank order ratings of Night Foreman converted to linear values) for Age, Education, and Experience

Fettler 8-66.01
N = 35

	M	σ	Range	rF_1	rF_2	rF_3
Age (years)	38.3	9.4	22-53	.047	-.122	.072
Education (years)	8.5	1.9	4-12	.036	.193	-.022
Experience (months)	34.7	30.3	2-150	-.055	.060	.202

When N = 35, correlations of .430 and .335 are required for significance at the .01 and .05 levels of confidence, respectively. Table II shows that none of the three criteria is significantly related to age, education, or experience.

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III. Job Description

Job Title: Fettler 8-66.01

Job Summary: Picks up trim (piece of unbaked tile) from belt press conveyor belt or receives trim from Press Operator; fettles (smooths) edges with sandpaper; brushes dust and foreign particles from trim with brush; inspects trim for defects; places good trim in sagger for subsequent drying and baking.

Work Performed

1. Picks up trim from belt press conveyor belt and fettles edges with sandpaper: Picks up trim from conveyor belt with right or left hand, depending upon position at belt; turns trim with left hand and at the same time fettles all edges of top side of trim with right hand by rubbing small piece of sandpaper held between index and third finger over edges of trim, being careful not to apply excessive or too moderate pressure with sandpaper to insure smooth fettling of trim edges. Turns trim completely around and fettles edges of other side of trim.

2. Receives trim angle piece from Press Operator and fettles edges with sandpaper: Receives trim angle piece from Press Operator with left hand, turns trim with left hand and at same time fettles all edges of top side of piece with right hand by rubbing small piece of sandpaper over edges, being careful not to apply excessive or too moderate pressure with sandpaper to insure smooth fettling of trim edges. Turns trim completely around and fettles edges of other side.

3. Brushes dust and foreign particles from trim with brush, inspects trim for defects, and places good trim in sagger: Picks up brush from lap or dust collector, brushes dust and foreign particles from sides and edges of trim, returns brush to lap or dust collector. Inspects trim for stickers, grease, dirty face, and chips; discards scrap trim on conveyor belt. Places good trim in specified position in sagger to insure proper baking in kiln.

4. Continues picking up, fettling, and inspecting trim and placing trim in saggers in cooperation with other Fettlers until work order is completed.

5. May be required to fettle trim stretcher, 6" x 1/2". Brushes dust and foreign particles from tops of five trim pieces with brush, using right hand; picks up same five trim pieces with left hand, stacks on shelf beside conveyor belt, inspects for stickers, grease, dirty face, and chips, discards scrap trim on conveyor belt. After worker has accumulated easily handled pile of good trim pieces, picks pile up with both hands, places in sagger on bench at left in specified position to insure proper baking in kiln. Continues brushing, picking up, inspecting, and placing trim in saggers until work order is completed.

6. May fold pieces of newspaper to specified sizes: Folds pieces of newspaper and stacks them in service boxes for use in lining saggers in packing of green ceramics in saggers.

IV. Experimental Battery

All of the tests of the GATB, B-1001, were administered to the sample group.

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V. Criterion

Fettlers were rated by three foremen: the Day Foreman, the Night Foreman, and the General Foreman, under the direction of a test technician. Fettlers were assigned to one of four categories: a "marginal" category, lower 25 percent, upper 25 percent, and middle 50 percent. The "marginal" category consisted of workers who would be the first to be released if satisfactory replacements for them could be obtained. Each foreman placed the Fettlers within each of the four categories in rank order.

The General Foreman rated the Fettlers on a list of 37, who had taken the GATB. One of these Fettlers was designated as a "trainee" and was not rated. Thus, there were ratings by the General Foreman for 36 Fettlers.

The Day Foreman assigned his ratings to a list of 36 Fettlers. One of these Fettlers was designated as a "trainee." He did not know two workers well enough to be able to rate them. There were ratings by the Day Foreman for 33 Fettlers.

The Night Foreman assigned ratings to a list of 38 Fettlers. One of these Fettlers was designated a "trainee." This foreman did not know five Fettlers well enough to rate them. Thus, there were ratings by the Night Foreman for 32 Fettlers.

Ranks assigned to the Fettlers by all three foremen within categories were assumed to be continuous from category to category. These ranks were assigned linear values. After the names of the four Fettlers who had been dropped from the sample were deleted from the three arrays of linear values, intercorrelations between the three foremen's ratings were computed. These intercorrelations are shown below:

Linear Values of Rank Order Ratings	r
General Foreman - Day Foreman	.752 (N=31)
General Foreman - Night Foreman	.498 (N=29)
Day Foreman - Night Foreman	.662 (N=26)

(NOTE: The difference in size of N's is due to the matching and correlating of ratings only for the Fettlers who were rated by both foremen.)

Correlations of .456, .470, and .496 are required for significance at the .01 level, when N=31, 29, and 26 respectively. All of the above correlations are significant at the .01 level of confidence. The highest agreement between the three sets of foremen correlations are:

General Foremen - Day Foreman	.752
Day Foreman - Night Foreman	.662

The correlations between the General Foreman's and the Day Foreman's ratings (.752) and between the Day Foreman's and the Night Foreman's ratings (.662) show substantial agreement. However, the correlation between the General Foremen's and the Night Foreman's ratings (.498) shows comparatively low agreement.

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In order to retain equal N's for all three foremen's ratings, linear values of ratings for Fettlers who had not been rated by one foreman or by two foremen were adjusted and added, or merely added, to the list of ratings of the foreman, or foremen, who had not rated these workers. When two foremen had rated a certain Fettler, but the third foreman had not, the two linear values for this worker were averaged and added to the list of linear values of the foreman who had not rated this person. Only one Fettler was omitted from the rating lists of the two foremen; the one linear value obtained for this Fettler was added to the lists of the two foremen who had not rated this worker. Subsequently all linear values were adjusted for an N of 35. The criteria did not have this overlapping when they were intercorrelated.

Finally, there were three sets of linear values for 35 Fettlers. These were the three criteria which were considered for the sample of Fettlers in this study.

VI. Statistical and Qualitative Analysis

Table III shows the means, standard deviations, and Pearson product-moment correlations with the criteria for the aptitudes of the GATB.

The means and standard deviations of the aptitudes are comparable to general population norms with a mean of 100 and a standard deviation of 20.

TABLE III

Means (M), Standard Deviations (σ), Pearson Product-Moment Correlations with the Criteria (rF_1 - Rank order ratings of General Foreman converted to linear values), (rF_2 - Rank order ratings of Day Foreman converted to linear values) and (rF_3 - Rank order ratings of Night Foreman converted to linear values) for the Aptitudes of the GATB

Fettler 8-66.01
N = 35

Aptitudes	M	σ	rF_1	rF_2	rF_3
G-Intelligence	81.8	14.2	-.079	.011	.123
V-Verbal Aptitude	84.3	14.3	-.008	-.052	.120
N-Numerical Aptitude	84.5	17.5	-.043	.097	.176
S-Spatial Aptitude	87.9	15.6	.086	.103	.056
P-Form Perception	85.5	21.9	.010	.078	.032
Q-Clerical Perception	83.8	14.8	-.134	-.055	.068
A-Aiming	84.5	19.0	-.047	.140	.173
T-Motor Speed	84.7	19.6	-.055	.092	.147
F-Finger Dexterity	91.7	16.6	.484**	.604**	.441**
M-Manual Dexterity	95.7	19.8	.251	.311	.339*

** Significant at the .01 level
* Significant at the .05 level

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The statistical results were interpreted in the light of the job analysis data. The job analysis indicated that the following aptitudes measured by the GATB appeared to be important for this occupation:

Form Perception (P) - for inspecting trim for stickers, grease, dirty face, and chips.

Aiming (A) and Motor Speed (T) - for turning, fettling, and brushing trim and placing in saggers.

Finger Dexterity (F) - for turning trim with left hand and fettling with right hand.

Manual Dexterity (M) - for picking up trim while working on the belt press and for turning, fettling, and brushing trim and placing it in saggers.

The highest mean scores were obtained for Aptitudes F and M. All aptitudes, except Aptitude P, have standard deviations of less than 20.

When N = 35, correlations of .430 and .335 are significant at the .01 level and the .05 level, respectively. Aptitude F shows significant correlations at the .01 level with each of the three criteria. Aptitude M, shows significant correlation at the .05 level with the ratings of the Night Foreman.

Aptitudes F and M were considered for inclusion in the test norms on the basis of their importance in terms of the job analysis and statistical data. Both of these aptitudes have relatively high means and show significant correlations with one or more of the criteria. The criteria were dichotomized and tetrachoric correlations were computed between the dichotomized criteria and several sets of trial norms consisting of Aptitudes F and M and various cutting scores.

Although Aptitudes P, A and T appear to be important on the basis of job analysis data, none of these aptitudes show any evidence of statistical significance. Therefore, none of these aptitudes was included in the final test norms.

The cutting score for Aptitude F was set at one standard deviation unit below the mean and rounded to the higher adjacent five-point score level. The cutting score for Aptitude M was set at one standard deviation unit below the mean and rounded to the nearest five-point score level. Setting scores at these levels yielded the best selective efficiency for the norms and resulted in cutting scores of 80 and 75, for Aptitudes F and M, respectively.

VII. Concurrent Validity of Norms

For the purpose of computing the tetrachoric correlation coefficient between the test norms and the criteria and applying the Chi Square test, the criteria were dichotomized by placing approximately one-third of the workers in the low criterion group. This resulted in the linear score of 41 as the criterion critical score for each of the three criteria. Thus, 11 of the 35 women, or 31 percent of the sample, were placed in the low criterion group. Tetrachoric correlations were computed between the test norms and each of the criteria. A significant tetrachoric

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correlation was obtained between the test norms and the ratings of the Night Foreman. No significant relationship was obtained between the test norms and the ratings of either the General Foreman or the Day Foreman. The results obtained for the Night Foreman's ratings are shown below.

Table IV shows the relationship between test norms consisting of Aptitudes F and M with critical scores of 80 and 75, respectively and the dichotomized criterion (rank order ratings of Night Foreman converted to linear values) for Fettler 8-66.01. Workers in the high criterion group have been designated as "good workers" and those in the low criterion group as "poor workers."

TABLE IV

Relationship between Test Norms Consisting of Aptitudes F and M with Critical Scores of 80 and 75, Respectively and the Criterion (Rank Order Ratings of the Night Foreman Converted to Linear Values) for Fettler 8-66.01

N = 35

	Non-Qualifying Test Scores	Qualifying Test Scores	Total
Good Workers	3	21	24
Poor Workers	6	5	11
Total	9	26	35

r_{tet} = .69 X^2 = 4.953

$\sigma_{r_{tet}}$ = .30 P/2 < .025

The data in the above table indicate a significant relationship between the test norms and the ratings of the Night Foreman.

VIII. Conclusions

On the basis of mean scores, correlations with the criterion, job analysis data and their combined selective efficiency, Aptitudes F and M with minimum scores of 80 and 75, respectively, are recommended as B-1001 norms for the occupation of Fettler 8-66.01. The equivalent B-1002 norms consist of F-75 and M-75.